STATE OF CONNECTICUT

Zika Virus Surveillance and Response Plan, 2016
DRAFT, 02/11/2016

Introduction

The Zika Virus Surveillance and Response Plan is based on the West Nile Virus Surveillance and Response Plan updated in 2012 by the Mosquito Management Program (MMP), an interagency state working group led by the Department of Energy and Environmental Protection (DEEP). The purpose of this Plan is to provide a guide for the state's Zika virus prevention activities. The Plan will be modified and updated as additional information and federal guidance regarding this newly emerging threat becomes available.

Zika virus, first discovered in Uganda in 1947, was limited to Africa and Asia infrequently causing human illnesses. In May 2015, the World Health Organization reported the first local transmission of Zika virus in the Western Hemisphere. As of February 9, 2016, local transmission has been identified in at least 26 countries or territories in the Americas, including Puerto Rico, with further spread to other countries in the region likely but precisely to what extent is currently not known.

In the Western Hemisphere Zika virus is transmitted primarily by *Aedes aegypti*, the mosquito that also spread yellow fever, dengue and chikungunya viruses. *Aedes aegypti* are aggressive daytime biters and can also bite at night. They become infected with Zika virus when they bite a person already infected with the virus and can then transmit the virus when they bite another person. While *Ae. aegypti* is not present in Connecticut a related species, *Ae. albopictus* has been identified in the southwestern area of the state. It is also considered capable of transmission of the virus but the degree to which transmission from this species may occur over time is not known. Of recent concern is also the possibility of spread from a woman to her baby during pregnancy and between sexual partners.

Historically and in the majority of recent case-patients Zika virus causes asymptomatic infections or relatively mild disease syndromes that are rarely fatal. However, an association with Guillain-Barre syndrome has been suggested and, during the current outbreak, an increased in birth defects among infants born to women infected during pregnancy is believed to be associated the virus.

Mosquito Management Program

In 1997, Public Act 97-289, "An Act Concerning Mosquito Control and Aerial Application of Pesticides," (CGS Sec 22a-45b) created the MMP to monitor mosquito breeding populations for the prevalence of infectious agents that can cause disease in humans and to determine when measures to abate a threat are necessary. The original focus of the program was to monitor the threat of Eastern equine encephalitis (EEE) virus. The Act authorizes the necessary measures to abate any pest-borne threat, including prevention and remedial measures, and allows for the application of broad spectrum chemical pesticides to address an imminent peril to the public health, safety, or welfare posed by pests. The Mosquito Management Program is based on an integrated pest management (IPM) approach, which includes a combination of surveillance, education, source reduction, larval and adult mosquito control and personal protection measures.

Based on the multiple modes of potential transmission, severe health consequences to neonates, the role of laboratory testing for diagnosis medical management and heightened public concern, Governor Dannel P. Malloy designated the Department of Public Health (DPH) as the lead agency for the State's response to Zika virus. The DPH will also be responsible for conducting surveillance for human cases of Zika virus associated illnesses and coordinating dissemination of information. The Department of Energy and Environmental Protection (DEEP) will provide technical advice regarding mosquito control to municipalities and The Agricultural Experiment Station will conduct mosquito surveillance and provide entomological expertise.

Surveillance Activities

Public health surveillance is the ongoing and systematic collection, analysis, and interpretation of health data in the process of describing and monitoring a health event. This information is used for planning, implementing, and evaluating public health interventions and programs. Surveillance activities are at the core of the Plan and currently include surveillance for Zika virus in humans and mosquitoes.

Human Surveillance

The surveillance for disease in humans caused by Zika virus is coordinated by the DPH. Zika virus was recently declared a nationally notifiable disease. DPH is adding Zika virus disease to list of mandatory reporting diseases in Connecticut effective Monday, February 15, 2016. Similarly, the lists of Reportable Diseases, Emergency Illnesses and Health Conditions and Reportable Laboratory Findings will be amended to include Zika virus associated illnesses including microcephaly among neonates and Guillain-Barre syndrome As of 2/9/2016 there are no commercially available diagnostic tests; all testing for Connecticut residents is conducted at the Centers for Disease Control and Prevention (CDC). Specimens are submitted to the DPH Laboratory for shipment to the CDC. Required patient demographic, clinical and travel history is collected by the DPH Epidemiology and Emerging Infections Program (EEIP) using a standardized questionnaire. Staff of the EEIP are available 24/7/365 to answer questions and facilitate testing of appropriate specimens.

During the first week after onset of symptoms, Zika virus disease can often be diagnosed by performing reverse transcriptase-polymerase chain reaction (RT-PCR) on serum. Virus-specific IgM and neutralizing antibodies typically develop toward the end of the first week of illness; cross-reaction with related flaviviruses (e.g., dengue and yellow fever viruses) is common and may be difficult to discern. Plaque-reduction neutralization testing can be performed to measure virus-specific neutralizing antibodies and discriminate between cross-reacting antibodies in primary flavivirus infections.

The DPH Public Health Laboratory (PHL) expects to have the ability to conduct RT-PCR for Zika virus by the end of February. Specimens submitted will also be tested for dengue and chikungunya viruses which are circulating in the same geographic areas and transmitted by the same mosquito vector, *Ae. aegypti*. In addition the Laboratory will also offer serologic testing as soon as reagents become available from the CDC and the PHL completes the validation process.

Recommendations for testing is evolving and quickly changing. The emphasis is currently on testing of specimens from pregnant women with a history of travel to areas where Zika virus is circulating in the prior 2-12 weeks. As testing becomes available at public health, hospital and commercial laboratories and more is learned about transmission and the spectrum of illnesses caused by Zika viruses testing protocols will be modified.

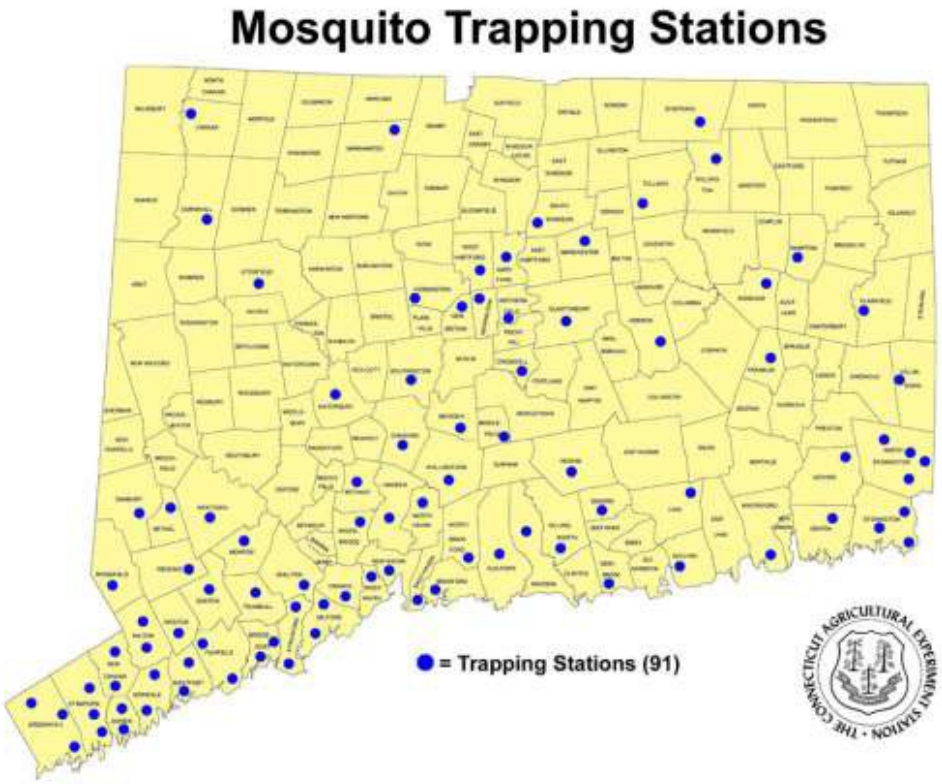
Should spraying of pesticides be conducted to reduce adult mosquito populations in response to Zika, WN or EEE viruses, the DPH also conducts surveillance for possible health effects of pesticide exposure. Physicians are encouraged to report to the DPH Environmental and Occupational Health Assessment Program possible pesticide-related health effects. The DPH compiles and summarizes this information and reports significant findings to the local health departments and other agencies as appropriate. This system is based on National Institute for Occupational Safety and Health classification of acute pesticide- related illness. The DPH assists local health departments monitor calls from the general public regarding health complaints and reports unusual clustering of complaints in terms of location or time to the DEEP Division of Pesticides for investigation of possible misapplication of pesticide.

Mosquito and Virus Surveillance

Surveillance for Zika virus in mosquitoes is integral to the public health response in Connecticut. The Connecticut Agricultural Experiment Station (CAES) maintains a network of 91 fixed mosquito-trapping stations located in 72 municipalities throughout the state providing information that includes mosquito species composition and abundance in the community, seasonal and spatial distribution of mosquito vectors, and prevalence of virus infections mosquitoes. One-third of the sites are located in southern Fairfield and New Haven counties where the highest levels of West Nile virus (WNV) activity in mosquitoes and humans

have been detected in previous years. Transmission of WNV is primarily by *Culex pipiens* mosquitoes which like *Ae. albopictus* lays its eggs in small containers of water often found near homes.

Traps are set and attended by CAES staff every 10 days at each site on a regular rotation from June through October. At least two trap types are used at all trapping to trap host-seeking adult female mosquitoes (all species), and a Gravid Mosquito Trap designed to trap previously blood-fed adult female mosquitoes (principally *Culex* and container breeding *Aedes* species). Mosquitoes are transported alive to the laboratory each morning where they are identified to species. Mosquitoes are grouped (pooled) according to species, collecting site, and date and then frozen. Aliquots of each mosquito pool are inoculated into Vero cell cultures for detection of mosquito-borne arboviruses of public health importance. Isolated viruses are identified by Real Time (TaqMan) PCR or standard RT-PCR using virus-specific primers. All of the virus isolation work is conducted in a certified Bio-Safety Level 3 laboratory at the CAES. Weekly test results are reported to the CDC electronically via ArboNet and to the DPH for dissemination to other state agencies, local health departments, the media, and neighboring states.



Prevention Activities

Environmental Control

The primary mode of transmission is by mosquito bites. Therefore, pre-emptive mosquito control is the most effective way to prevent transmission of Zika virus and other mosquito-borne viruses. The most effective and economical way to control mosquitoes is by larval source reduction through local abatement programs that monitor mosquito populations and initiate control before disease transmission occur. With similar preferences for breeding habitat efforts to reduce *Culex pipiens* populations for control of WNV will also reduce populations of *Ae. albopictus*. In Connecticut, municipalities are responsible for coordination of mosquito control activities on municipal and private lands in their jurisdictions, working with state agencies on behalf of residents, and enforcement of abatement requirements of mosquito breeding areas if necessary. Technical advice regarding source reduction is available for municipalities from the DEEP Wetlands Habitat and Mosquito Management Program.

Prevention activities in Connecticut adapted from CDC national recommendations include:

Before mosquito season

- Conduct public mosquito education campaigns focusing on reducing or eliminating larval habitats for *Ae. albopictus* (DEEP, municipalities)
- DEEP Mosquito Management Program will update and maintain the state's web site: www.ct.gov/mosquito with information on mosquito-borne illness in humans, mosquito surveillance and control options.
- Conduct surveys to determine abundance, distribution, and type of containers; large numbers of containers may translate into high mosquito abundance and high risk (municipalities with technical assistance/training provided by DEEP).
- Cover, dump, modify or treat large water-holding containers with long-lasting larvicides (municipalities, property owners)
- DEEP Pesticide Management Program will prioritize registration of products and the issuance of permits needed for the commercial application of pesticides and insecticides.
- DEEP Solid Waste Program will assist with outreach and education efforts and will prioritize coordination with local officials to address blight and illegal disposal of materials such as tires. Will pursue enforcement actions involving large-scale tire disposal areas.

Beginning of mosquito season

- Continue public education campaigns focusing on reducing or eliminating larval habitats for *Ae. Albopictus*.
- Develop and distribute mosquito education materials about *Ae. albopictus* and personal protection measures (DPH, LHDs).
- Initiate *Ae. albopictus* community-wide surveys (municipalities with technical assistance from DEEP and CAES) to:
    - determine presence or absence
    - estimate relative abundance
    - determine distribution
    - develop detailed vector distribution maps
    - evaluate the efficacy of source reduction and larvicide treatment
- Initiate adult sampling to identify or confirm areas of high adult mosquito abundance (CAES)
- Consider preventive adult control to reduce adult populations targeting areas of high mosquito abundance (Municipalities)

Single or several imported cases

- Begin public mosquito containment education campaigns aimed at preventing or minimizing contact between vectors and human cases, especially during the first week of illness when an infected person is viremic and can infect mosquitoes, thereby possibly triggering a local outbreak
    - Educate the public to continually dispose of water holding containers to eliminate larval habitats.
    - Treat with long-lasting larvicide (see larvicide options on next page) any water-holding containers that cannot be dumped, covered, discarded, or otherwise modified.
    - Eliminate larval habitats within 100-200 yards/meters around the affected property.
- Consider community source reduction, adult mosquito, and case containment initiatives to minimize the spread of infected mosquitoes
- Educate the public about reported cases of disease and urge them to use:
    - Insect repellents
    - Window and door screens to prevent mosquitoes from entering the house
    - Air conditioning

Single or several local mosquito-acquired cases

- All measures above for Single or several suspected/confirmed imported/ cases
- Adult mosquito control

- Treat the outdoors within 100–200 yards/meters around a case's home
- Initiate/maintain adult sampling to estimate adult mosquito abundance and evaluate effectiveness of insecticide treatments

Outbreak - clusters cases

- Divide the outbreak area into operational management areas where control measures can be effectively applied to all buildings and public areas within a few days; repeat as needed to reduce mosquito density
- Conduct door-to-door inspections and mosquito control in an area-wide fashion
- Identify and treat, modify, or remove mosquito-producing containers
- Organize area/community clean-up campaigns targeting disposable containers (source reduction), including large junk objects that accumulate water (broken washing machines, refrigerators, toilets) in buildings, public areas, etc.
- Combine outdoor spatial or residual spraying with source reduction and larviciding (including residual spraying of container surfaces and adjacent mosquito resting areas). Don't forget to treat storm drains, roof gutters and other often overlooked cryptic water sources

Insecticides

Larvicides can be used to control mosquitoes in the aquatic stage before they become biting adults. This type of control using insecticides generally is the most effective at controlling mosquitoes and has the least effect on non-target species and the environment. Ideally, use of larvicides is started early in the mosquito season repeated as necessary. The use of larvicides may require a permit from the DEEP, and the product must be registered for use in Connecticut. Depending upon the type of product used, or for commercial applications, the applicator must be licensed by the DEEP Pesticide Division to apply mosquito pesticides. Recommended larvicide use is as per Strategies for the Application of Larvicides to Control Mosquitoes in Response to West Nile Virus in Connecticut (updated and approved by DEEP, DPH, CAES, DoAG in January, 2014). The following options are available.

- Products containing the biological agents Bacillus sphaericus (Bs) or Bacillus thuringiensis var. israelensis (Bti). B. sphaericus comes in a granular, wetable powder, slow release briquette or water-soluble packet formulation. Also available are dual-action formulations of Bs and Bti. The bacterial strains in Bs are more specific to *Culex* larvae than Bti. Bs and Bti are bacterial agents and must be ingested by the filter-feeding mosquito larvae and as such, these products will not affect mosquito pupae or adults. The use of Bti or Bs on municipal or individual homeowner property does not require any special licensing by the CT DEEP.
- S-methoprene (trade name Altosid®). Methoprene is an insect growth regulator and comes in a variety of liquid, granular, pellet and briquette formulations. If using Altosid for catch basins a pellet, 30-day or 150-day briquette formulation is recommended. Methoprene will not affect pupae or adults. Connecticut regulations specify that the use of methoprene requires that the applicator be licensed and a permit be obtained from the DEEP prior to application. Also, PA 13-197 prohibits certain uses of methoprene in the coastal zone (http://www.cga.ct.gov/2013/ACT/PA/2013PA-00197-R00HB-06441-PA.htm).
- The biological agent Saccharopolyspora spinosa or Spinosad (trade name Natular®). Spinosad comes in a variety of formulations and works on all mosquito species. Natular will not affect mosquito pupae or adults. Although it is a bacterial agent, because of its mode of action, Connecticut regulations specify that the use of spinosad requires that the applicator be licensed and a permit be obtained from the DEEP prior to application.
- The Larvasonic® Acoustic Larvacide Device emits sound waves to kill mosquito larvae (www.newmountain.com). The Larvasonic works on all species of mosquitoes. Mosquito larvae must be present for the Larvasonic to be effective and as such, requires more intensive larval surveillance. Since this device works by emitting sound waves, it is not considered a pesticide and therefore is exempt from pesticide regulations.

Adulticides can be used to kill adult mosquitoes when a quick reduction of mosquitoes is needed. Currently available adulticides may be applied by hand-held, backpack or truck-mounted Ultra Low Volume (ULV) foggers, or by fixed-wing or rotary aircraft. These materials have advantages and disadvantages that will

influence which material is most appropriate for a given situation, and all must be applied according to regulations and label directions. Weather and logistical conditions are important factors influencing the ability to effectively control adult mosquito as well as the preferred habitat and feeding habits of the target mosquito species.

Preventing Mosquito Bites

There is no available vaccine to prevent Zika virus infection and no specific treatment for Zika virus related illnesses. Prevention depends on avoiding mosquito bites. When travelling to countries where Zika virus or other viruses spread by mosquitoes are found people should take the following steps:

- Weather permitting wear long-sleeved shirts and long pants
- Stay in places with air conditioning or that use window and door screens to keep mosquitoes outside
- Sleep under a mosquito bed net if you are overseas or outside and are not able to protect yourself from mosquito bites
- Use Environmental Protection Agency (EPA)-registered insect repellents. When used as directed, EPA-registered insect repellents are proven safe and effective, even for pregnant and breast-feeding women.
    - DEET
    - Picaridin (also known as KBR 3023)
    - Oil of lemon eucalyptus (OLE) or PMD (Products containing OLE include Repel and Off! Botanicals)
    - IR3535
    - Always follow the product label instructions
    - Reapply insect repellent as directed
    - Do not spray repellent on the skin under clothing
    - If you are also using sunscreen, apply sunscreen before applying insect repellent
- If you have a baby or child:
    - Do not use insect repellent on babies younger than 2 months of age
    - Dress your child in clothing that covers arms and legs, or
    - Cover crib, stroller, and baby carrier with mosquito netting
    - Do not apply insect repellent onto a child's hands, eyes, mouth, and cut or irritated skin
    - Adults: Spray insect repellent onto your hands and then apply to a child's face.
- Treat clothing and gear with permethrin or purchase permethrin-treated items
    - Treated clothing remains protective after multiple washings - see product information to learn how long the protection will last
    - If treating items yourself, follow the product instructions carefully
    - Do not use permethrin products directly on skin
- If you have Zika, protect others from getting sick, avoid mosquito bites during the first week of illness

Prevention of Sexual Transmission of Zika Virus

Sexual transmission of Zika virus is possible, and is of particular concern during pregnancy. Current information about possible sexual transmission of Zika is based on reports of three cases. At present, Zika virus testing for the assessment of risk for sexual transmission is of uncertain value, because current understanding of the incidence and duration of shedding in the male genitourinary tract is limited to one case report in which Zika virus persisted longer than in blood. At this time, testing of men for the purpose of assessing risk for sexual transmission is not recommended. As we learn more about the incidence and duration of seminal shedding from infected men and the utility and availability of testing in this context, recommendations to prevent sexual transmission of Zika virus will be updated.

Recommendations for men and their pregnant partners –

Men who reside in or have traveled to an area of active Zika virus transmission who have a pregnant partner should abstain from sexual activity or consistently and correctly use condoms during sex (i.e., vaginal intercourse, anal intercourse, or fellatio) for the duration of the pregnancy. Pregnant women should discuss their partner's potential exposures to mosquitoes and history of Zika-like illness with their health care provider; providers can consult CDC's guidelines for evaluation and testing of pregnant women.

Recommendations for men and their non-pregnant sex partners –

Men or women who reside in or have traveled to an area of active Zika virus transmission who are concerned about sexual transmission of Zika virus might consider abstaining from sexual activity or using condoms consistently and correctly during sex. Couples considering this personal decision should take several factors into account. Most infections are asymptomatic, and when illness does occur, it is usually mild with symptoms lasting from several days to a week; severe disease requiring hospitalization is uncommon. The risk for acquiring vector-borne Zika virus in areas of active transmission depends on the duration and extent of exposure to infected mosquitoes and the steps taken to prevent mosquito bites (http://www.cdc.gov/zika/prevention). After infection, Zika virus might persist in semen when it is no longer detectable in blood.

Important State Phone Numbers and Websites

State Mosquito Management Program Website — http://www.ct.gov/mosquito

Department of Public Health — http://www.ct.gov/dph

- Office of Communications — (860) 509-7270
  -Media inquiries
- Epidemiology and Emerging Infections Program — (860) 509-7994
  - Zika virus infections in people, laboratory testing of human specimens
- Environmental and Occupational Assessment Program — (860) 509-7740
  - Effects of pesticides on people
- Public Health Laboratory — (860) 920-6500
  - Technical questions regarding testing and shipping of human specimens from physicians, hospitals, laboratories

Department of Energy and Environmental Protection — http://www.ct.gov/deep

- Communications Division — (860) 424-4100
  - State mosquito control policy and programs
- Wetlands Habitat and Mosquito Management Program — (860) 642-7630
  - Technical questions regarding mosquitoes, mosquito control measures
- Pesticide Management Program — (860) 424-3369
  - Technical questions regarding safe pesticide use and chemical make-up. Also, persons who wish to be specifically notified prior to a pesticide application or those who are chemically sensitive to pesticides should contact the Pesticide Pre-Notification Registry at this number

Connecticut Agricultural Experiment Station — http://www.ct.gov/caes

- Center for Vector Biology & Zoonotic Diseases — (203) 974-8510
  - Technical questions regarding mosquito trapping and testing